

# Technology Opportunity

## Lewis' NDE Technology

The National Aeronautics and Space Administration (NASA) seeks to transfer newly developed and/or refined nondestructive evaluation (NDE) techniques for assuring quality, through manufacturing process control; integrity, through component quality verification; and life, through in situ and conventional nondestructive material characterization.

### Potential Commercial Uses

- Aerospace (nozzles, combustors, compressors)
- Automotive (turbocharger rotors, blisks, blades, vanes)
- Medical (bones, heart valves)
- Soil science (root growth, clay soil)
- Petroleum science (reservoir characteristics, oil recovery techniques)
- Structural ceramics (curing processes, nuclear fuel)
- Electronics (circuitry and sensors)
- Electrical power (characterization of deposits in boilers)

### Benefits

- Provides thermomechanical degradation and residual life assessment
- Reduces the number of defective parts and associated costs
- Enables the development of realistic fracture and life prediction codes
- Assures quality and reliability of components and parts

### The Technology

The NASA Lewis Research Center has developed, refined, and gauged the capabilities of a unique, advanced nondestructive evaluation technology. This technology allows measurement of material properties and provides high-resolution images of the internal structure of opaque materials being considered for use in high-temperature structural applications. The NDE techniques, which include high-resolution x-ray computed tomography,

digital radiography, acousto-ultrasonics, advanced ultrasonic imaging, and thermographic imaging, are used to measure the manufacturing quality of materials and the processes used to fabricate the materials, monitor damage in materials as they are loaded or at interrupted load points, and investigate failure mechanisms. The materials interrogated include monolithic ceramics and metals, and composites of all types (e.g., polymer matrix with graphite fiber, ceramic matrix with ceramic or carbon fiber, metal matrix with silicon carbide or oxide fiber). In addition to materials interrogation and flaw characterization, in situ NDE establishes a better understanding of material response and validates fracture-prediction and damage-accumulation models.

### Options for Commercialization

One of NASA's missions is to commercialize its technology. The NASA Lewis Research Center NDE team's aim is to commercialize either the software, the hardware, or the systems associated with the ultrasonic, acousto-ultrasonic, radiographic, and thermographic techniques.

#### Lewis Research Center NDE Techniques

- Immersion ultrasonic scanning
- Contact ultrasonic scanning
- Laser and piezo-acoustic microscopy
- Acoustic emission and radiographic mechanical test monitoring
- Acousto-ultrasonic materials characterization
- Laser vibrography and fracture imaging
- Thermal wave imaging
- Microfocus and digital radiography
- X-ray tomography and laminography



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## Key Words

Nondestructive evaluation  
Quality control  
Process control  
X-ray  
Ultrasonics  
Acousto-ultrasonics  
Thermography  
Tomography  
Digital radiography  
Manufacturing optimization  
In situ NDE  
Composite NDE



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